

## **REMARKS/ARGUMENTS**

### **Status of Claims**

Claims 12 to 33 are pending in this application with claim 12 being the only independent claim. Claims 12, 19, and 25 have been amended to remove informalities indicated in the Office Action without narrowing the scope of any claims or any elements contained therein. New claims 28-32 have been added. Support for the new claims can be found in Fig. 2 and page 7, line 34 to page 8, line 16 of the specification as originally filed.

Reconsideration of the subject application is hereby respectfully requested.

### **Overview of the Office Action**

Claims 19 and 25 stand rejected under 35 U.S.C. § 112, second paragraph as being indefinite.

Claims 12-14 and 17 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,066,408 (*Vitale*).

Claims 12-16 and 20-21 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,689,500 (*Nelson*).<sup>1</sup>

Claims 18 and 24 stand rejected under 35 U.S.C. § 103 as being unpatentable over Nelson in view of U.S. Published Application No. 2003/0012986 (*Koschany*).<sup>2</sup>

Claims 19 and 25 stand rejected under 35 U.S.C. § 103 as unpatentable over Nelson in view of U.S. Patent No. 5,972,530 (*Shelekhin*).

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<sup>1</sup> It appears that the Office Action intends to include claims 23 and 27 in this rejection. Applicants request that clarification be made in the next Office Action.

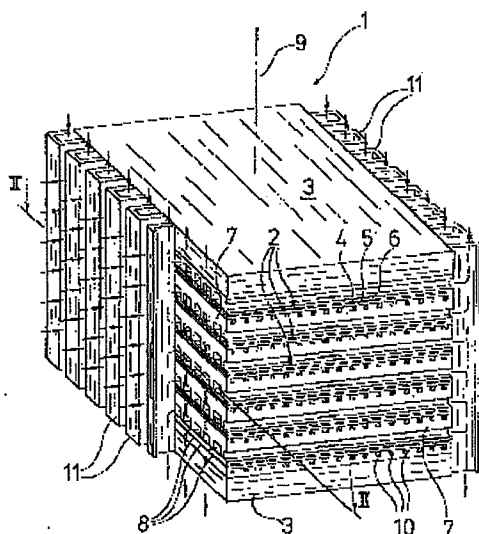
<sup>2</sup> It appears that the Office Action intends to include claims 22 and 26 in this rejection. Applicants request that clarification be made in the next Office Action.

## Amendments Addressing Informalities

Claims 19 and 25 have been amended to address the alleged informalities. In addition, applicants have initiated a correction for a typographical error in independent claim 1.

## Summary of the Subject Matter Disclosed in the Specification

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner as part of the discussion presented herein, and are not intended to argue limitations which are unclaimed. Fig. 1 is reproduced below for the Examiner's convenient reference.



The present specification describes a fuel cell stack 1 formed with plural fuel cells 2 arranged above one another and clamped between end plates 3. Each fuel cell 2 has a membrane electrode assembly formed by a polymer electrolyte membrane 4, and an anode 5 and cathode 6 on the opposite sides of the membrane 4.

A bipolar plate 7 is arranged between adjacent membrane electrode assemblies 4, 5, 6 and formed with parallel channels 8. The parallel channels 8 are open towards both ends and extend transversely to the stack axis 9 and to the longitudinal channels 10 which supply fuel to the fuel cells 2. The transverse channels 8 supply oxygen to the fuel cells 2 and remove heat for purpose

of cooling. The routing of the air within a fuel cell 2 runs in opposite directions in adjacent transverse channels 8 in each fuel cell 2.

Collector channels 11 are provided to connect the outflow sides of the ends of the transverse channels 8 of all fuel cells 2. A current flowing in opposite directions through adjacent channels 8 of the same fuel cell 2 can be created within the channels 8 via the collecting channels 11 when the flow is fed into the fuel cell stack 1 from both sides (*see* also Fig. 2), resulting in a homogeneous temperature distribution with the fuel cell 2 or the stack 1.

### **Patentability of the Claimed Invention**

#### **Independent Claim 1**

Independent claim 1 recites that “each of said channels ha[s] two open ends” and “a direction of flow of one of said channels is opposite to a direction of flow of an adjacent one of said channels in said each of said fuel cells.” Applicants submit that the above recited claim features are not disclosed by either *Vitale* or *Nelson* because adjacent channels in such cited art have the same flow direction based on the detailed reasoning below.

*Vitale* discloses a fuel cell cooler-humidifier plate 202 with coolant flow channels 206, 206' and humidification flow channel 218 (*see, e.g.,* Figs. 2A and 6). Without admitting or disputing if these coolant flow channels 206, 206' are either “parallel” or “adjacent,” they have the same flow direction where portions of the coolant flow channels 206, 206' come to be adjacent to each other (*see, the* portions where the lead lines of numeral references 206, 206' point to in Fig. 6). As Fig. 6 of *Vitale* also illustrates, the openings of the adjacent portions on the coolant flow channels 206, 206' are subjected to the same coolant water inlet 606 through an inlet bridgepiece passage 608 (*see, also* col. 9, ll. 16-20). Accordingly, coolant flows downwardly in both of these adjacent portions of the coolant flow channels 206, 206'. In other

words, the flow directions of these adjacent portions of the coolant flow channels 206, 206' are the same.

*Nelson* discloses a fuel cell stack with a cathode cooler plate 20 having gas channels 28a, 28b, 28c, 28d (*see, e.g.,* Fig. 4). In *Nelson*, all intake openings 68a, 68b, 68c, 68d of the gas channels 28a, 28b, 28c, 28d are arranged at the same side, while all outlet openings 70a, 70b, 70c, 70d are arranged at the other side of the channels. While the gas channels 28a, 28b, 28c, 28d may each have certain bent around sections with opposite flow directions, no two adjacent gas channels 28a, 28b, 28c, 28d have opposite flow directions as recited in independent claim 1. In contrast, the adjacent gas channels 28a, 28b, 28c, 28d in *Nelson* have the same flow direction.

For the above reasons, neither *Vitale* nor *Nelson* teach, at least, “a direction of flow of one of said channels is opposite to a direction of flow of an adjacent one of said channels in said each of said fuel cells,” as recited in independent claim 1. Therefore, independent claim 1 patentably distinguishes over *Vitale* or *Nelson*. Withdrawal of the claim rejections of independent claim 1 is hereby respectfully requested.

#### Dependent Claims 13-32

Claims 18-19, 22, and 24-26 depend, directly or indirectly, from allowable independent claim 1. *Koschany* and *Shelekhin* are cited in the Office Action against the additional features in claims 18-19 and 24-25 but do not remedy the deficiencies of *Vitale* or *Nelson*. Therefore, claims 18-19 and 24-25 are each allowable for at least the same reasons that independent claim 1 is allowable.

Claims 13-17, 20-21, 23, 27-32 depend, directly or indirectly, from allowable independent claim 1 and, thus, each is allowable therewith.

The amount of \$50.00 (small entity) for payment for the addition of 2 new claims in excess of 20 should be charged to our Patent and Trademark Office Deposit Account No. 03-2412. Any additional fees or charges required at this time in connection with the present application may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

**Conclusion**

Based on all of the above, it is respectfully submitted that the present application is now in proper condition for allowance. Prompt and favorable action to this effect and early passing of this application to issue are respectfully solicited.

Respectfully submitted,

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